ATLAS HA-711-B

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MAJOR GEOHYDROLOGIC UNITS IN AND ADJACENT TO THE OZARK PLATEAUS PROVINCE, MISSOURI, ARKANSAS, KANSAS AND OKLAHOMA—BASEMENT CONFINING UNIT

By Jeffrey L. Imes

INDEX MAP

HYDROLOGIC INVESTIGATIONS ATLAS
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IMES—MAJOR GEOHYDROLOGIC UNITS, OZARK PLATEAUS PROV., BASEMENT CONFINING UNIT, MO., ARK., KANS., OKLA. 1:750,000 ATLAS HA-711-B

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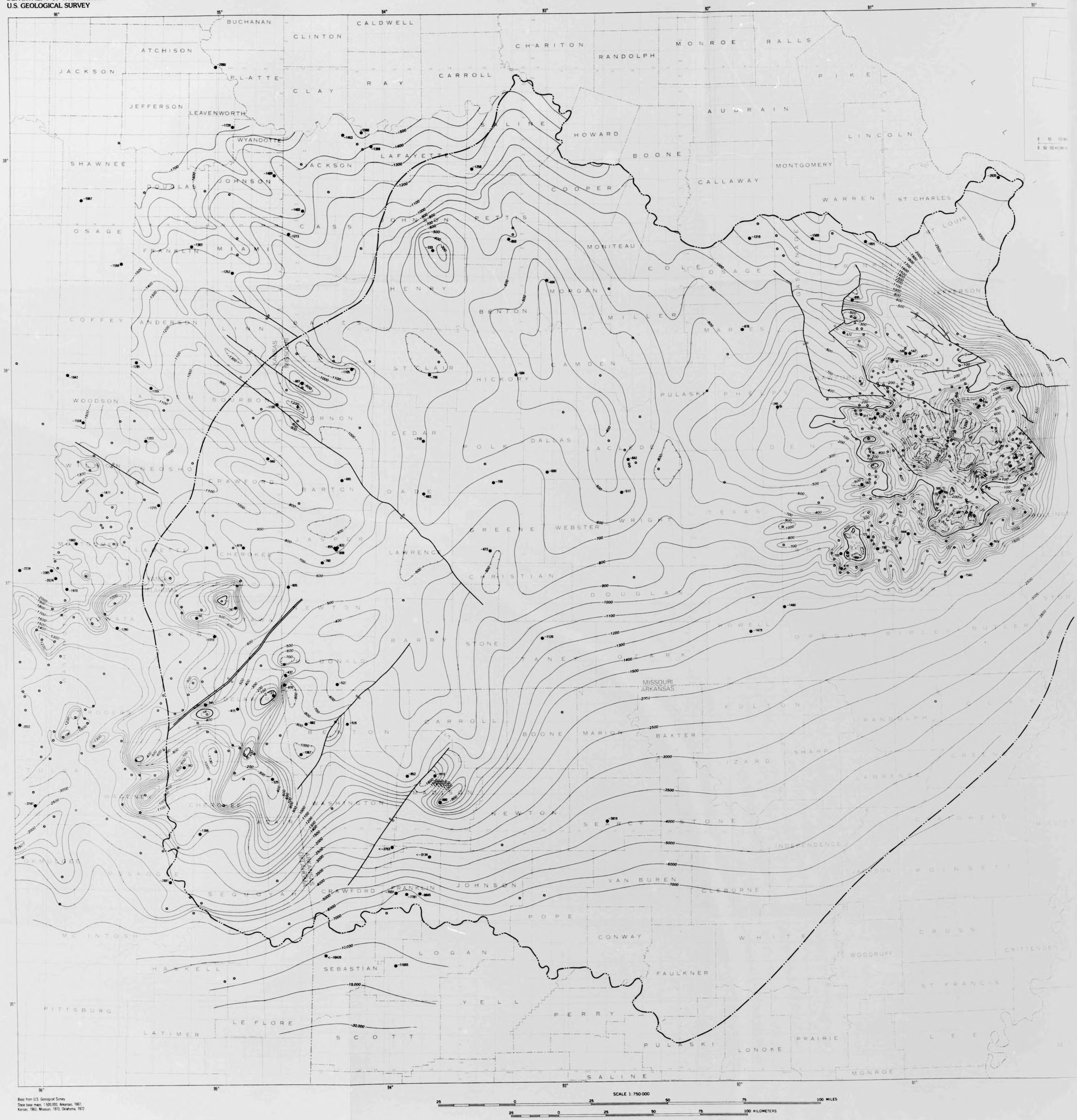

Base from U.S. Geological Survey
State base maps, 1:500,000: Arkansas, 1967; Kansas, 1963; Missouri, 1973; Oklahoma, 1972

SCALE 1:750,000

25 0 25 50 75 100 MILES

25 0 25 50 75 100 KILOMETERS

Altitude of top of Basement confining unit

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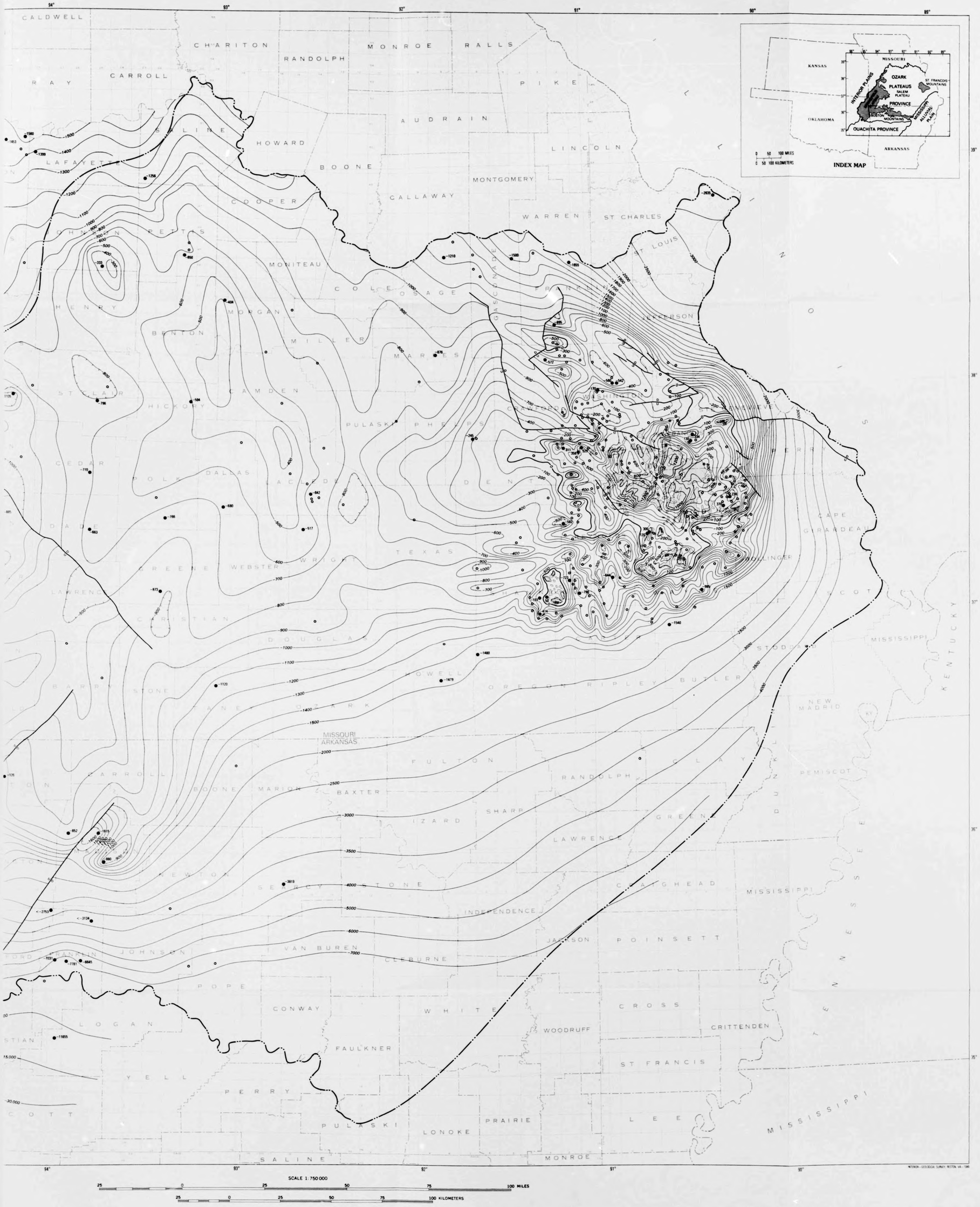

Altitude of top of Basement confining unit

ADJACENT TO THE OZARK PLATEAUS PROVINCE, MISSOURI, ARKANSAS, KANSAS, AND OKLAHOMA—BASEMENT CONFINING UNIT

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EXPLANATION

Outcrop area of Basement confining unit

Contact

Fault—U, upthrown side; D, downthrown side

Approximate boundary of Ozark Plateaus aquifer system

Structure contour—Shows altitude of top of Basement confining unit.[1] Contours in areas of few control points are consistent with control points and contours on maps of overlying geohydrologic units. Contours in outcrop areas are modified from 1:500,000 scale, Missouri State base map. Contour interval, in feet, is variable. Hachures indicate depression in Basement confining unit. National Geodetic Vertical Datum of 1929.

Control data point—Part of Central Midwest Regional Aquifer-System Analysis data base. Number is altitude, in feet, of the top of Basement confining unit (< means less than). National Geodetic Vertical Datum of 1929

Auxiliary control data point

[1] Contours in Kansas and Oklahoma also are consistent with a set of supplementary data points not shown. These data are derived from the altitude of a shallower geologic unit and an estimate of the thickness of deposits between the shallower formation and the Precambrian basement. See Cole (1976), and Denison (1981).

INTRODUCTION

An investigation of the geohydrologic system in the Ozark Plateaus province (index map and Fenneman, 1938) has been made as part of the Central Midwest Regional Aquifer-System Analysis (Jorgensen and Signor, 1981), a major study of the regional aquifer system in parts of 10 States. The study is one of several by the U.S. Geological Survey that are designed to increase knowledge of the flow regime and geohydrologic properties of regional aquifer systems in the United States. Because a large quantity of fresh ground water is available in aquifers underlying the Ozark Plateaus province, a subregional project has been established to study the geohydrologic units of this area in more detail than is practical in the regional study. The stratigraphic relationship among the primary geohydrologic units in the Ozark Plateaus province is discussed in Chapter A of this Hydrologic Investigations Atlas series. This chapter focuses on one of those geohydrologic units, the Basement confining unit.

The Ozark Plateaus aquifer system and that part of the stratigraphically equivalent Western Interior Plains aquifer system that abuts the western and southern boundary of the Ozark Plateaus aquifer system rest upon a confining unit of virtually impermeable igneous and metamorphic rocks of Precambrian age. These rocks crop out in the St. Francois Mountains (index map) of southeastern Missouri where gradual uplift of the Ozark dome in late Paleozoic time has resulted in removal of younger sedimentary rocks by erosion. Contours on the Precambrian surface are modified from previously published maps for each of the four States: Missouri (Kisvarsanyi, 1975), Arkansas (American Association of Petroleum Geologists and U.S. Geological Survey, 1967), Kansas (Cole, 1976), and Oklahoma (Denison, 1981). From its area of greatest altitude in the St. Francois Mountains, the surface dips steeply to the north, east, and south. To the west it dips into the subsurface, then levels to a plateau that underlies most of southwest Missouri and extreme northeast Oklahoma and northwest Arkansas. The southward extension of contours beyond the limit of available well-log data in western Arkansas was inferred from seismic reflection data (Lillie and others, 1983).

GEOHYDROLOGIC PROPERTIES

Predominant rock types in the St. Francois Mountains are rhyolitic ashflow tuffs and granite. The dominant rock type in the remainder of the Ozark Plateaus province is mainly granite and rhyolite, except in the northwest part where granitic gneiss is present. The structurally complex, block-faulted Ozark uplift contains many major fault and fracture zones. These zones and physiographic features show significant correlation with major lineaments on Landsat imagery (Kisvarsanyi and Martin, 1977). Additional lineament evidence indicates the Precambrian surface is more highly fractured than information derived from well-log data indicates. This extensive network of fault and fracture zones accounts for the fact that the Basement confining unit locally can yield small quantities of water, however, yields are variable. Of 14 water wells drilled into the Precambrian in its outcrop area in Madison, Iron, and St. Francois Counties, Missouri, 70 percent yielded less than 10 gal/min. Two of these wells were dry, including one well drilled to a depth of 310 feet. The most productive of the four wells that yielded more than 10 gal/min was a flowing well that yielded 70 gal/min.

REFERENCES

American Association of Petroleum Geologists and U.S. Geological Survey, 1967, Basement map of North America between latitudes 24° and 60°N: U.S. Geological Survey, map scale 1:5,000,000.

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CONVERSION FACTORS

Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer
gallon per minute	0.06308	liter per second

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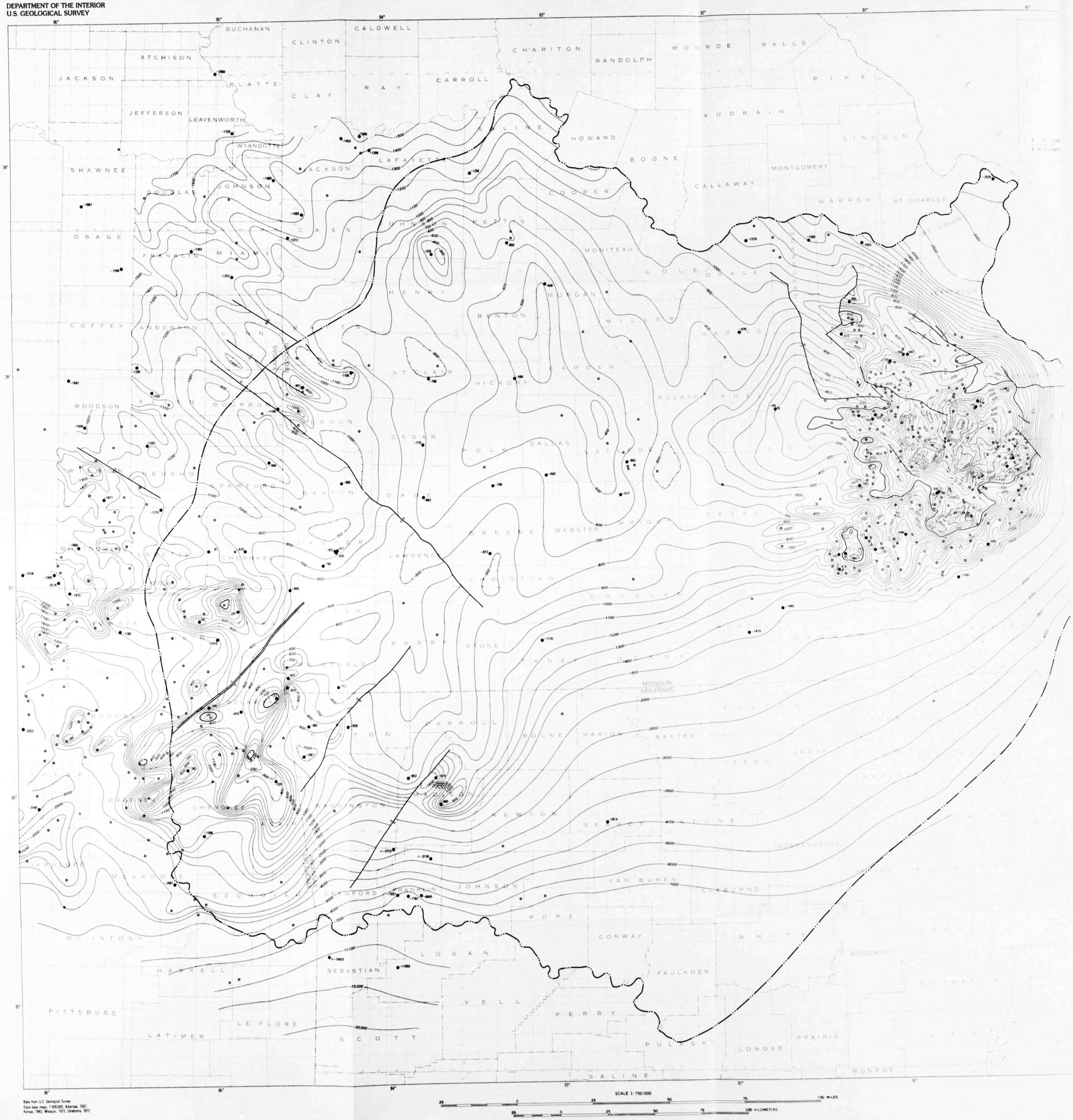

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Altitude of top of Basement confining unit

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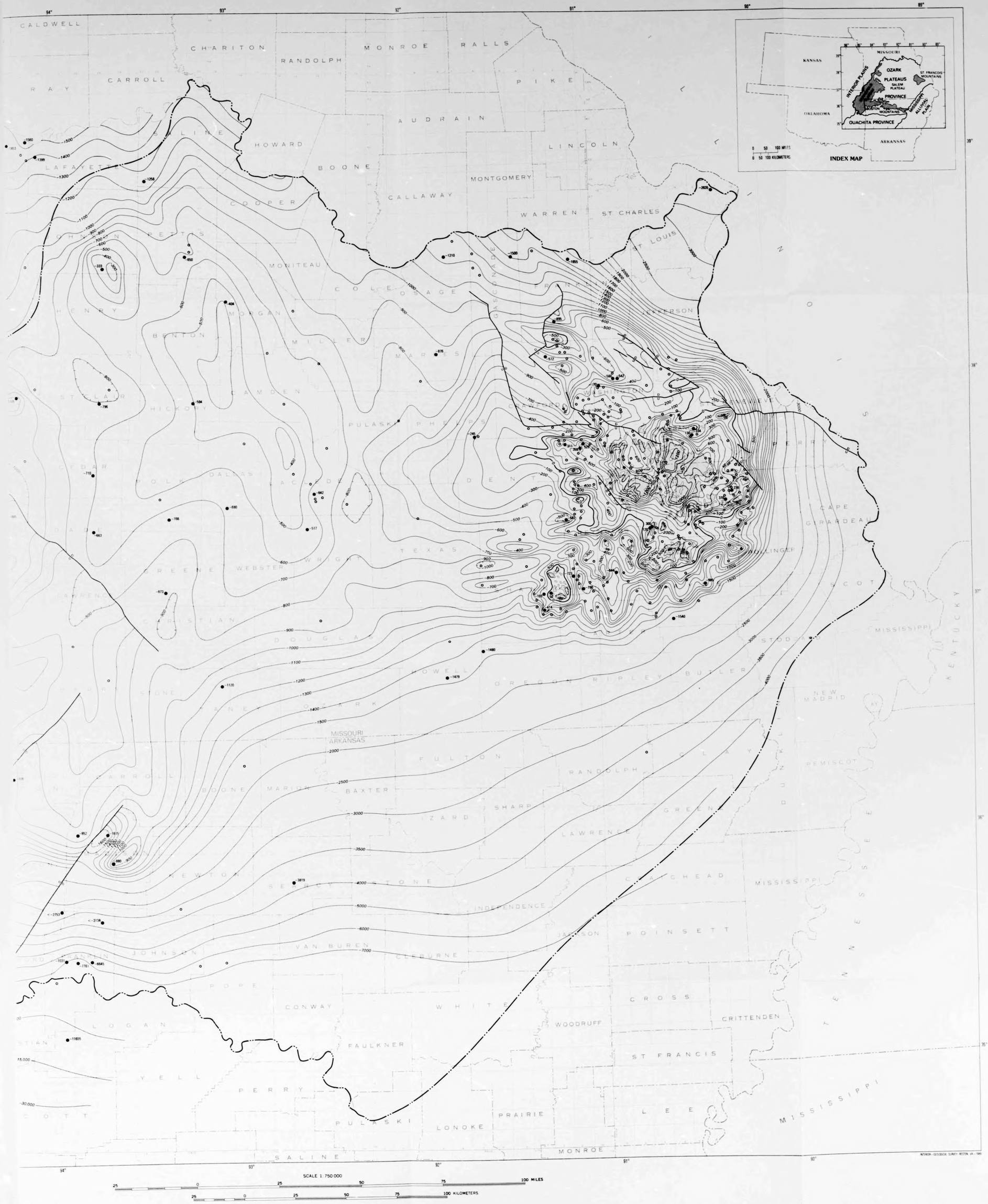

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